

Matrices for Management and Social Sciences

Assignment 5

- [6] 1. Find a vector equation and a set of parametric equations of the line passing through the points $P(-1, 3, 2)$ and $Q(-4, 3, 1)$.
- [9] 2. Let $P(3, 2, 5)$, $Q(4, 1, 7)$ and $R(2, 1, 4)$ be 3 points in \mathbb{R}^3 . Find the following.
- $\overline{PQ} + 3\overline{PR}$
 - The coordinates of the point S if $\overline{PS} = \overline{QR}$
 - $|\overline{PR} + \overline{QR}|$
- [10] 3. Let $A = \begin{bmatrix} 2 & 4 & -5 \\ 1 & 3 & -3 \end{bmatrix}$. Which of the following vectors belongs to the null space of A ?
- $\mathbf{u}_1 = (1, 2, 3)$, $\mathbf{u}_2 = (3, 1, 2)$, $\mathbf{u}_3 = (0, 0, 0)$, $\mathbf{u}_4 = (0, 0)$, $\mathbf{u}_5 = (6, 2, 4)$
- [10] 4. Find the null space of the given matrix. If the null space is more than the zero vector alone, describe it as the span of a set of vectors.
- $$A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$
- [15] 5. Determine whether or not the set W is a subspace of the given vector space V .
- $W = \{(b-a, b) : a, b \text{ real numbers}\}$; $V = \mathbb{R}^2$;
 - $W = \{(x, -x, 2x) : x \text{ real number}\}$; $V = \mathbb{R}^3$;
 - $W = \{(1, x, 0) : x \text{ real number}\}$; $V = \mathbb{R}^3$.
- [5] 6. Let $\mathbf{u} = (1, 2)$ and $\mathbf{v} = (-2, 1)$. Find all values of k such that $|\mathbf{u} + k\mathbf{v}| = \sqrt{30}$.
- [10] 7. Find the value of k for which the following vectors are linearly dependent.
- $\mathbf{u}_1 = (1, k, 1)$, $\mathbf{u}_2 = (k+1, 4, 1)$, $\mathbf{u}_3 = (5, 7, k)$.

- [15] 8. Consider the vectors $\mathbf{u}_1 = (1, 5, 2)$, $\mathbf{u}_2 = (-2, -3, 3)$, $\mathbf{u}_3 = (3, 2, 1)$, $\mathbf{w} = (0, 4, 4)$.
- Determine whether the set $\{\mathbf{u}_1, \mathbf{u}_2, \mathbf{u}_3\}$ is linearly independent or dependent.
 - Determine whether $\mathbf{w} \in \text{Span}\{\mathbf{u}_1, \mathbf{u}_2, \mathbf{u}_3\}$.
 - If possible, write \mathbf{w} as a linear combination of $\mathbf{u}_1, \mathbf{u}_2, \mathbf{u}_3$.